

Expected outcome:

- Increased rice production: The newly developed pyramided lines will help to ensure rice production in particularly more than 2 million hectares submergence prone rainfed lowland rice areas of the country leading to possible 2-3 million tons of more rice production per year in Bangladesh.
- High income of farmers: Farmers income will be increased with the cultivation of newly developed pyramided lines.
- Improvement of socio-economic condition of farmers: The livelihood status of the farmers will be upgraded with the more return coming from the increased rice production from their rice field.
- Environment friendly agro-ecosystem: The agro-ecosystem will be more environment friendly with the cultivation of resistant varieties.
- Coping-up rice cultivation with the changing scenario of climate: With the change of climate, the advent of flash flood and incidences of diseases might increase. The newly developed pyramided lines will be useful in coping up rice production with this changed agro-ecosystem.

Lesson learned:

- Foreground selection for the bacterial blight resistant genes
- Bacterial blight resistant xa13 gene is present in BRRI dhan52
- Procurement, financial and administrative management of the project
- Strengthening MAS laboratory of plant breeding division, BRRI

For Further Information:

Dr. K M Iftekharuddaula, Principal Scientific Officer, Plant Breeding Division, Bangladesh Rice Research Institute, Gazipur-1701, Bangladesh and Principal Investigator, Pyramiding Bacterial Blight Resistant Genes into the Genetic Background of BR11-derived Submergence Tolerant Rice Lines (ID-179) Project, SPGR Sub-Project, NATP, BARC, Farmgate, Dhaka-1215; Mobile : 0088-01732761747,
Email : kiftekhar03@yahoo.com

Towards Development of Disease Resistant cum Flash Flood Tolerant Rice Variety



**Plant Breeding Division,
Bangladesh Rice Research Institute
Gazipur-1701**

**Project Implementation Unit,
Bangladesh Agricultural Research Council,
Farmgate, Dhaka-1215**



Purpose

- BRRI dhan52 was developed in 2010 as a flash tolerant high yielding T. Aman rice variety but unfortunately this variety showed susceptibility against the bacterial blight (BB) disease.
- This incident necessitated for the incorporation of BB resistant genes into the genetic background of BRRI dhan52 so that introgressed line could show wider adaptability giving more yield under farmers' field condition.
- Bacterial blight (BB) caused by *Xanthomonas oryzae* pv. *oryzae* (Xoo) is one of the most widespread and important diseases of rice in most of the rice growing countries due to its high epidemic potential and destructiveness to high yielding cultivars in Asia.
- The most effective approach to manage bacterial blight disease to keep loss below economic injury level is the use of resistant varieties.
- Two bacterial blight resistant genes viz. Xa21 and xa13 showed more than 90% resistant frequencies against the presently available Bangladeshi strains of the pathogen.
- That's why, efforts were undertaken at BRRI through the funding from **PIU, NATP, BARC** to pyramid these two BB resistant genes along with flash flood tolerant QTL SUB1 into the genetic background of BRRI dhan52 utilizing Marker-Assisted Backcrossing technique.

Approach and Methodology: IRBB60 was used as the donor of bacterial blight resistant genes in hybridization scheme while BRRI dhan52, the recently released high yielding submergence tolerant rice variety was used as recipient parent. Foreground and background selection approach of Marker-Assisted Backcrossing (MABC) was utilized up to BC3F1 generations to identify the best plant. The MABC work was initiated in 2010 at the field and Marker-Assisted Selection laboratory of plant breeding division of Bangladesh Rice Research Institute, Gazipur. In foreground selection, ART5 (gene-based marker for SUB1 QTL) and Xa21 (gene-based marker for Xa21 gene) markers were used to detect and confirm the presence of SUB1 QTL and Xa21 gene. In background selection, 60 polymorphic markers between BRRI dhan52 and IRBB60 were used to recover the recipient parent genetic background. Standard laboratory protocol for SSR and STS markers were followed in genotyping.

At least three best plants were identified in each backcross generation and backcrossing was done with the recipient parent BRRI dhan52 following standard hybridization methodology followed at BRRI to produce backcross-F1 seeds.

Key finding and Achievement:

- o In BC3F1 generation of Boro 2011-12, both Xa21 and ART5 markers were used and one plant was obtained with heterozygous alleles for both Xa21 and ART5 markers.
- o Background selection was done with 60 SSR markers to investigate % of recipient genome in the selected best plant of BC3F1 generation.
- o In the best plant, 45 markers out of 60 markers were like recipient parent type and the percentage of recipient alleles was 87.5 %.

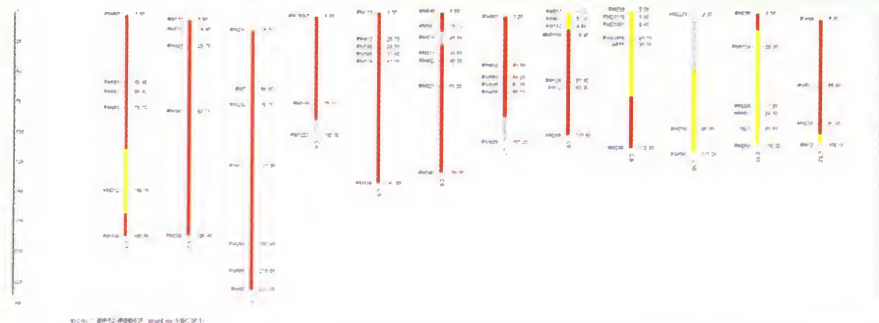


Fig. 1. Graphical Genotype of the best plant in BC3F1 generation: the red coloured regions are showing the recovery of the recurrent parent genome

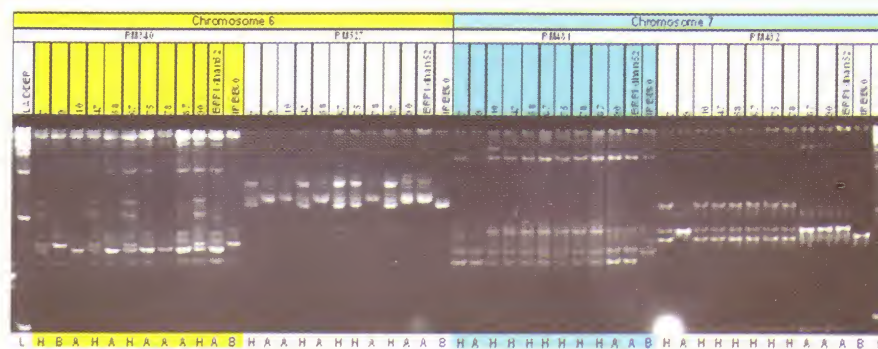


Fig. 2. Partial view of the gel picture of the background selection using some background markers in BC3F1 generation